CLAIMS

1. Time-of-flight mass spectrometer for the analysis of samples, comprising
(a) a sample carrier with spatially separated samples,
(b) a pulse laser for ionizing the samples by laser desorption of a sample positioned in a laser beam focus point,
(c) one or more ion detectors having a high level of time resolution for the measurement of the ion currents,
(d) a focusing system for the pulse laser beam generating a pattern of fixed focus points, matching the relative positions of at least a subset of the spatially separated samples on the sample carrier,
(e) a movement system for the sample carrier capable to bring at least a subset of the samples into the laser focus point pattern, and
(f) an ion focusing system projecting all the ions created at the focus points by the ionizing laser desorption pulses onto the one or more ion detectors.

2. Time-of-flight mass spectrometer as in claim 1wherein the focus pattern has 4, 7, 9, 16, 25 or 36 focal points.

3. Time-of-flight mass spectrometer as in claim 1 wherein the sample carrier has a large number of spatially separated samples forming a pattern, the spacings of which correspond to the spacings of the focal points in the focus pattern.

4. Time-of-flight mass spectrometer according to claims 1 wherein the ion spectra from more than one pulsed laser desorption of the sample are required for the analysis of each sample.

5. Time-of-flight mass spectrometer as in claim 1 wherein the beam focusing system contains a beam splitter to split the beam spatially, and in which the splitting of the beam creates all the laser pulse focal points for the focus pattern at the same time.

6. Time-of-flight mass spectrometer as in claim 5 wherein the ion focusing system projects the ions from all samples in the focus pattern onto one detector for joint measurement of the ion currents.

7. Time-of-flight mass spectrometer as in claim 5 wherein the ion focusing system projects the ions from each sample in the focus pattern each onto their own ion detector.

8. Time-of-flight mass spectrometer as in claim 7 wherein the ion detectors assigned to the samples consist of a common multi-channel plate multiplier with a number of spatially separated anodes.

9. Time-of-flight mass spectrometer as in claim 1 wherein a signal processing apparatus is present, and wherein the beam focusing system diverts the laser beam in time sequence to

every focal point in the fixed position focus pattern one after the other, so that the ion detector records the ion currents from the samples in a time sequence and passes them sequentially to the signal processing apparatus.

10. Time-of-flight mass spectrometer as in claim 9 wherein an ionizing laser pulse desorption method is applied to the samples in the focus pattern cyclically, wherein each sample is only subjected to laser desorption once in each cycle across the focal points of the focus pattern, and wherein the respective spectra from the samples over a number of cycles are summed together.

11. Method for the analysis of samples in a time-of-flight mass spectrometer by laser desorption using a pulsed laser for ionization, comprising the following steps:
a) generating a fixed-position pattern of focal points for the laser beam by a beam focusing system,
b) introducing a number of samples on a sample carrier to the locations of the focal points of the focus pattern simultaneously,
c) creating ions from all the samples that are positioned at the laser focal points by pulsed laser desorption, and
d) collecting the ions by an ion-focusing system and projecting the ions to one or more ion detectors.

12. Method as in claim 11wherein a beam splitter in the beam focusing system splits the pulsed laser beam in such a way that the focal points of the focus pattern are created simultaneously, and that the simultaneously generated ions from the samples are projected by the ion focusing and imaging system onto a common ion detector.

13. Method as in claim 11wherein a beam splitter splits the pulsed laser beam in such a way that the focal points of the focus pattern in the pulsed beam are created simultaneously, and that the simultaneously generated ions from the samples are projected by the ion focusing system onto ion detectors assigned to each sample.

14. Method as in claim 11wherein a moving deflection system deflects the laser beam focus in time sequence into the focal points of the focus pattern, and that the ion currents from the samples are measured in time sequence using one ion detector.